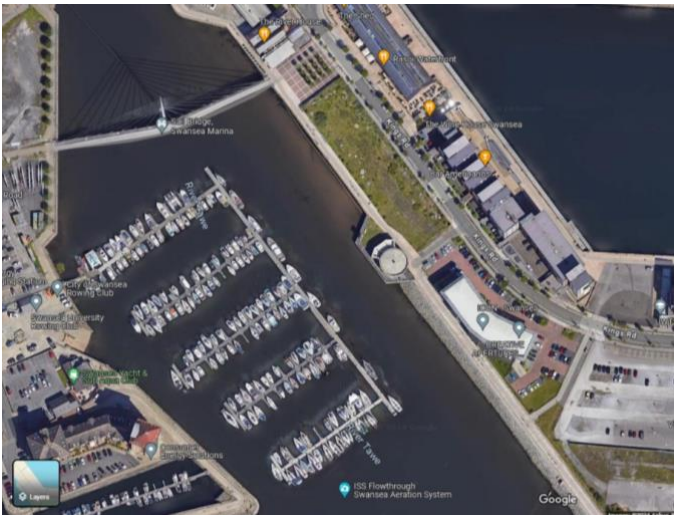




SA1

DEVELOPMENT

A New Medium-High Rise Student
Accommodation Block

ABSTRACT

This is a report outlining the potential design to a new proposed student accommodation block to the Prince of Wales Dock in Swansea.

Curtis Richards (2309713)

Construction Technology 2 – Assignment 1

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1. THE PROPOSED DEVELOPMENT

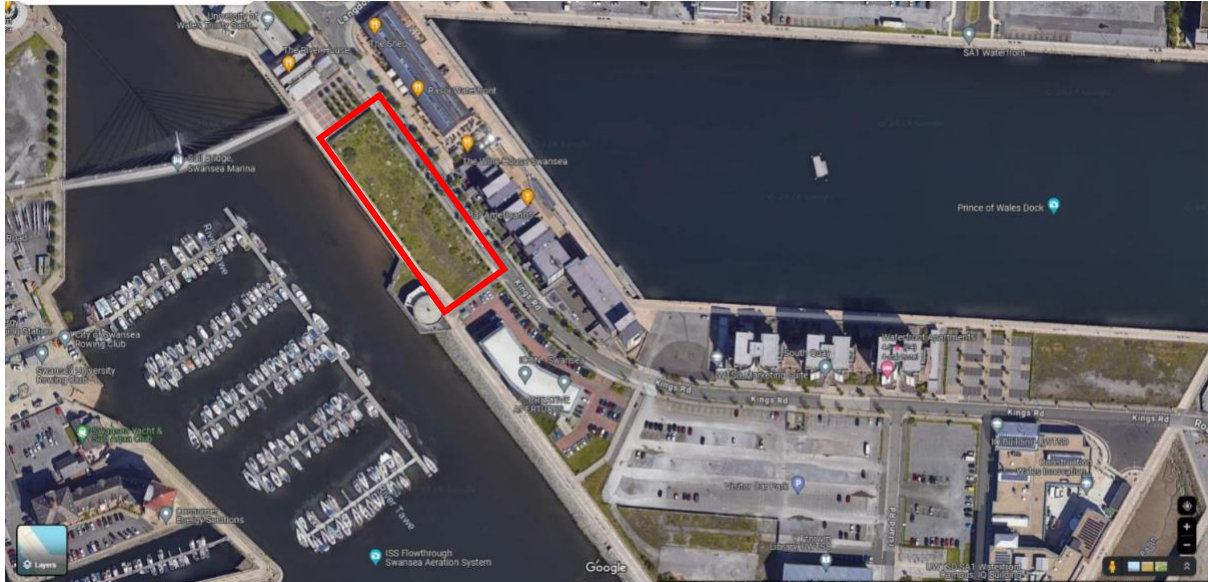


Figure 1.1: The Proposed Development

The proposed site for the new student accommodation is located on the west wing of the Prince of Wales Dock (*PoWD*), a permeable location and central to a host of amenities (*figure 1.1*). However, the dock has not always been a desirable environment and its past that is buried beneath the surface will provide many obstacles to construction.

It is integral that the site is fully appreciated, and all dangers are accounted. To achieve this a geological, borehole and local development preliminary investigation is provided within appendices 'A', 'B', and 'C'. This report acknowledges these are essential to the design of the proposed development, consequently they could not be emitted from the report however the word count limited the investigation to the appendix.

Any referenced figures from the appendix will commence with either an 'A', 'B', or 'C', for example '*figure A1*'.

2. FOUNDATIONS

It is evident based on the geological evidence and recent construction (*appendix A, B and C*) at the PoWD that the foundations for the new medium-high rise build will be piled. However, what is not clear from the information discussed is the type of piles that will be used.

To begin, there are two types of piles: end bearing piles and friction piles. Essentially the latter is used when no soil is capable of bearing the imposed load therefore the friction generates a bulb or pressure within the soil that transmits the pressure to greater depths (*Chudley and Greeno 2006*). These piles can also be ribbed to increase its frictional yield.

Table 2.1: Bearing Capacities (Emmitt and Gorse 2010)

GROUP	TYPES OF ROCKS AND SOILS	BEARING CAPACITY (kN/m ²)
<u>Rocks</u>	1. Strong igneous and gneissic rocks in sound condition	10 000
	2. Strong limestone and sandstone	4 000
	3. Schists and slates	3 000
	4. Strong shales, strong mudstones and strong siltstones	2 000
	5. Clay shales	1 000
	6. Dense gravel or dense sand and gravel	>600
<u>Non-cohesive soils</u>	7. Medium dense gravel or medium dense gravel and sand	>200-600
	8. Loose gravel and loose sand and gravel	>300
	9. Compact sand	100-300
	10. Medium dense sand	<100
	11. Loose sand	300-600
	12. Very stiff boulder clays and hard clays	150-300
	13. Stiff clays	150 - 300
<u>Cohesive soils</u>	14. Firm clays	75 - 150
	15. Soft clays and silts	75
	16. Peat and organic soils	Extreme caution
	17. Made-up ground or fill	

If the build utilises end-bearing piles, it will need to target the high-bearing rocks such as the mudstones and siltstones (*table 2.1*). To reach these depths, the borehole examples provided in this report (*Appendix B*) suggests that the piles would be > 25m long.

Therefore, a friction pile would be more efficient to minimise material, installation, and cost.

Moreover, the site proposes two key risks that dictate the type of friction pile; these being the assumed contamination and the proximity to existing buildings. The parameters create an ideal environment for bored displacement pile (BDP), an alternative to a continuous flight auger (CFA) pile. To begin, a BDP or a CFA does not require hammering or vibrating a pre-cast pile which can destabilise surrounding structures and create substantial noise pollution. Opposingly to the CFA, a BDP does not excavate soil instead it drives the soil apart which produces two main benefits. Firstly, it does not excavate any potential contaminated soil and secondly it compacts the surrounding soil which generates more friction between the soil and the pile, potentially reducing the piles length and thus its installation time (*Emmitt and Gorse 2010*). Finally, as the auger is returned to the surface, concrete is poured down a hollow tube through the auger before a reinforcement cage is positioned.

The piles are strategically placed to distribute the structure's load of to the ground, to facilitate this process piles are grouped in clusters and connected via a pile cap if the loading point exceeds the bearing capacity of a singular pile (*Chudley and Greeno 2005*). Usually, the pile cap will be connected to a raft or beam-like foundation with reinforcement bars to increase the structural uniformity (*figure 2.1*).

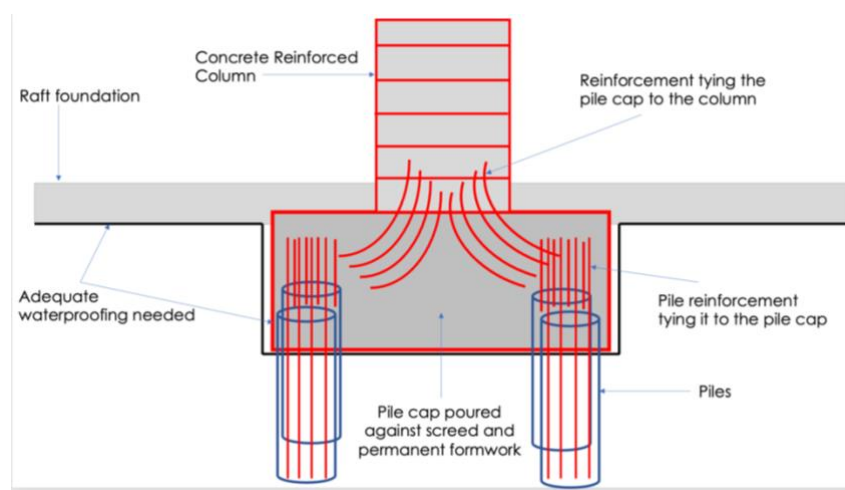


Figure 2.1: Proposed illustration of the pile cap-foundation detail

Considering the information above, the following foundation layout is suggested (*figure 2.2*). The site is approximately 120 x 45 metres, the 90 x 25 metre footprint of the building facilitates adequate greening, landscaping, and ease of access around the site. Due to the uncertainty of the ground conditions, and the known weak topsoil layer, it is suggested that a 5 x 3 pile cap layout is constructed with 4 BDP piles per cap to distribute the imposed loads.

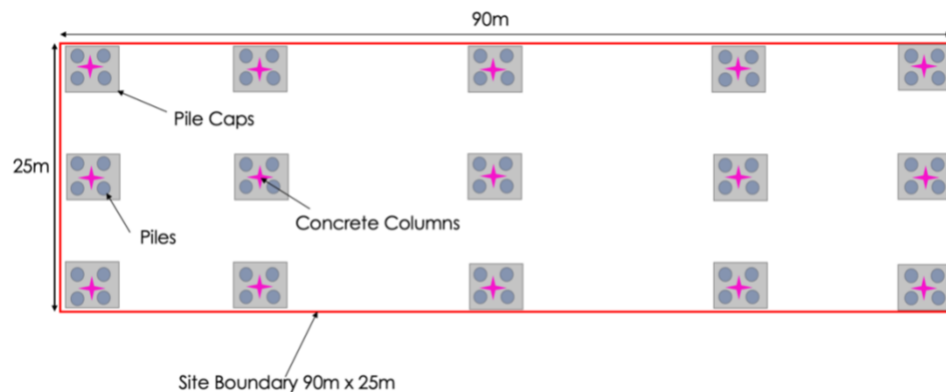


Figure 2.2: Proposed pile layout

The BDP is an on-site construction method, in principle it requires more time to bore, pour, and cure, increasing the on-site labour. Nevertheless, given the site conditions, these disadvantages are a minimal hinderance in comparison to the site-specific risks such as the pollution and weak ground. Furthermore, the proximity of the proposed development to existing structures renders pile driving as structural concerns and acoustic nuisances.

3. FRAME

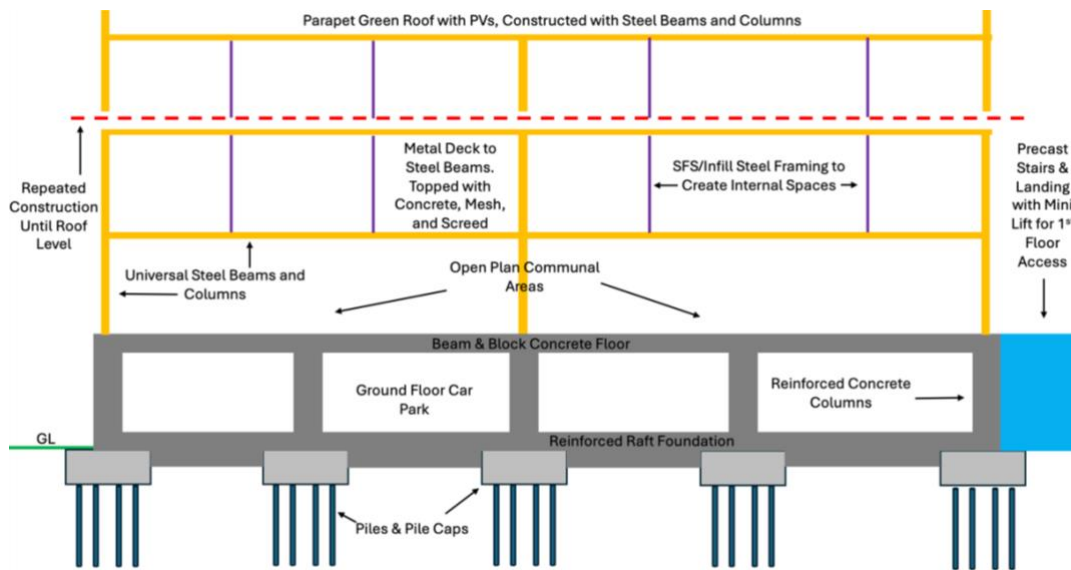


Figure 3.1: Proposed Frame Construction

The frame will consist of a reinforced concrete ground floor, which supports the continuing steel frame (figure 3.1). This design is proposed because the concrete columns can be easily integrated into the pile caps (figure 2.1). Given the risk of floods (figure A4) the ground floor will be a carpark, lifting the habitable space from ground floor level.

A steel frame is selected to continue the construction because its capability to span longer distances, whilst remaining secure, and ductile. The ductile characteristic of steel is a key element to allow the structure to flex slightly in strong winds that are common at the PoWD; a concrete frame being brittle may experience greater stress. Nevertheless, this principle is only critical when constructing skyscrapers because of the extreme wind exposure gained with elevation. The proposed development would not be subject to these extreme winds and consequently one could argue a continued concrete frame would be acceptable. However, the incorporation of a steel frame to the habitable elevations reduces the number of columns per floor, creating a more aesthetic layout especially at communal level (figure 3.1). Additionally, the utilisation of steel is a

prefabricated material that is precision crafted in a controlled environment and abolishes the curing requirement of concrete and reduces material waste as well as being a recyclable material that could be re-used and lends itself well to any future redesign.

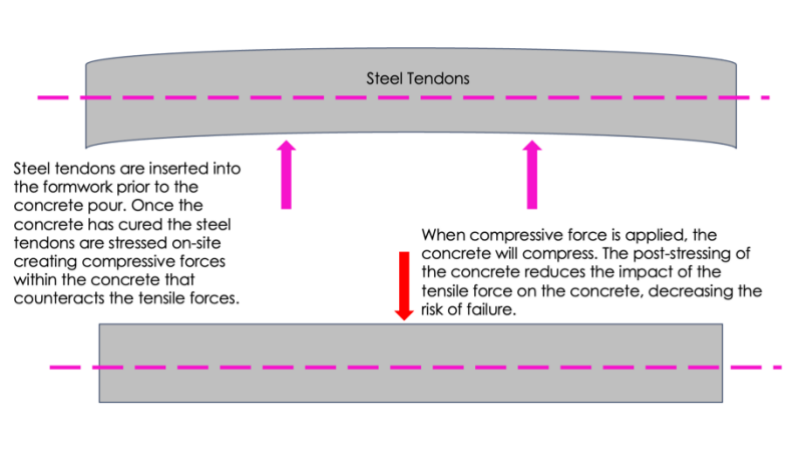


Figure 3.2: Applying post-tension to an in-situ concrete slab

The raft foundation in the car park will be reinforced to provide tensile and compressive strength, with additional tensile stress inserted to the raft using post-stressed steel tendons (*figure 3.2*). This approach is necessary as a raft foundation is reliant on the ground beneath to transmit loads, however it still requires tensile supplementation to ensure the foundation does not flex (*figure 3.3*) under the heavy vehicle loading. The raft will require 28 days to fully cure after the in-situ pour prior to any imposed loads.

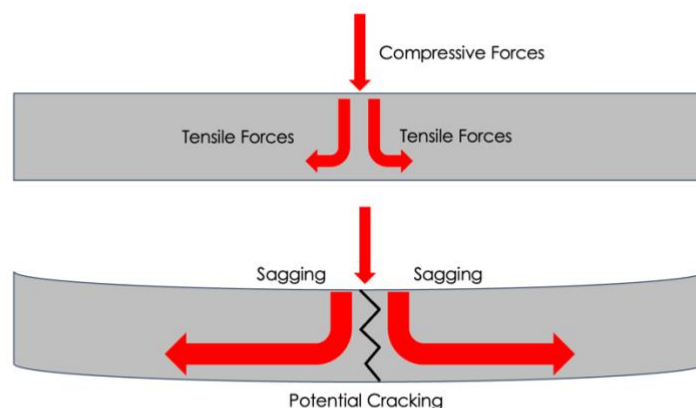


Figure 3.3: Compressive forces causing tensile stress on a concrete slab

Alternatively, high grade precast beams at 600 centres supported on the concrete columns and infilled with precast blocks will form the carpark soffit and the communal floor (*figure 3.4*). This quick and simple method of construction requires no formwork and once constructed it provides a working platform. After completion, the beam and block system is equipped with anti-cracking reinforcement, insulation, and topped with screed to suit the floor finish whilst providing a flat soffit underneath which can be left exposed, skimmed with plaster, or infilled with insulation and boarded. Importantly, this method is flexible to achieve the desired fire and acoustic ratings through its design and construction.

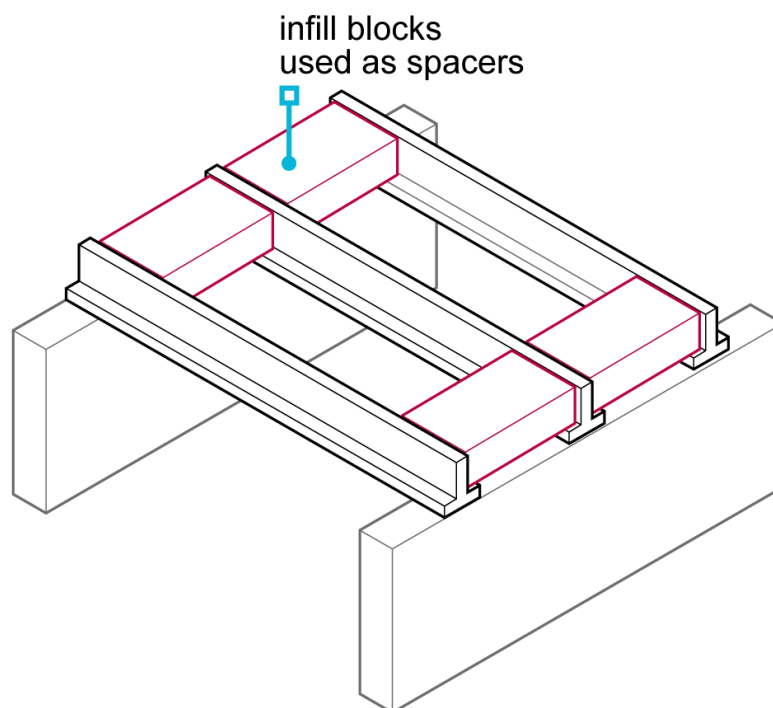


Figure 3.4: Precast beam and block construction (NHBC 2024)

A skeleton steel frame will continue the structure, maximising the internal floor space, reducing materials, and is flexible which facilitates design alternations throughout its lifespan such as external cladding and internal SFS (structural steel frame) partitions (*Riley and Cotgrave 2004*).

Typically, the steel frame is over-designed. Depending on the loading requirements, the engineer consults the standard steel loading. Usually there is never an exact match between load and steel sizes therefore the engineer will round-up for reassurance and to account for steel's compressive weakness.

Prior to installation, holding down bolts are cast into the concrete columns to bolt the frame into place (*Chudley and Greeno 2005*). Normally, the first two levels of the frame are verified for levelness before the bolts are grouted to the base plate, creating a bond to aid transmittance of loading. Joining steel members are either welded or bolted using high-tensile shear bolts in a multi-storey development such as this one. Bitumen based primer is applied to the lower steel members to protect from corrosion.

To enhance the unobstructed floor space, the design will incorporate an extended rectangular grid layout, with castellated beams used to create floor and ceiling joists that supports a metal decking layout topped with screed and a suitable finish (*figure 3.5*). Again, the screed requires curing time, however the combination of prefabricated steel supporting a metal deck floor is a popular and reliable method in modern buildings. The underside of the soffit will be insulated and boarded for acoustic and aesthetic purposes. Castellated beams are welded together using two separate beams cut along a castellated line creating a void to run services and a deeper profile to mitigate deflection (*Chudley and Greeno 2005*).



Figure 3.5: Castellated Beams (Cellbeam 2025)

Internally, SFS will create compartmentations within the floor spaces. Dependant on use, each partition is constructed to stricter acoustic and fire standards. Evidently the fire-critical spaces include access and egress routes, kitchens, and plant rooms whereas acoustic performance is essential between living spaces and isolating emittance of noise from mechanical equipment. These fire and acoustic targets are achieved by the number, thickness and type of linings, including insulative materials, and specialist sealants and fittings.

Cross bracing is incorporated both internally and externally to the steel frame to resist wind loading. The bracing of steel columns and beams pacify the wind-load force that has been imposed on the structure, allowing it to be transmitted to the foundations without causing fatal stress (*Emmitt and Gorse 2010*).

Finally, the steel frame will receive a coating of intumescent paint to protect the structures integrity in the event of a fire. It is possible to cast 50mm concrete casements around the steel or 100mm brick columns for 4hrs fire protection (*Chudley and Greeno 2005*), however this will increase the deadload and construction time significantly.

Alternatively, fire rated plasterboard will encase the columns, coupled with the intumescent paint this will provide adequate fire protection to the structural elements.

4. EXTERNAL WALLS –

The external appearance of the proposed development will homologise into the existing urban environment by utilising the surrounding architecture for inspiration. However, the design will not solely be a duplication of its neighbouring structures instead it will implement its own architectural personality.

A brick façade to the ground floor carpark is inspired by the facades found on the IQ building (*figure C2*). The bricks are tied back with angle brackets slotted into channels that are cast into the concrete columns. A cavity is formed using the angle brackets, providing space for insulation, ventilation and drainage (*figure 4.1*), additionally adequate DPCs and DPMs are required within this detail. Importantly this system must permit vertical and horizontal movement as materials expand and contract (*Emmitt and Gorse 2010*) therefore the fixing bolts for the brackets are vertically adjustable, in addition to compressible mastic forming horizontal movement joints at angle levels. Steel vertical anchors are required to restrain the wall against lateral forces.

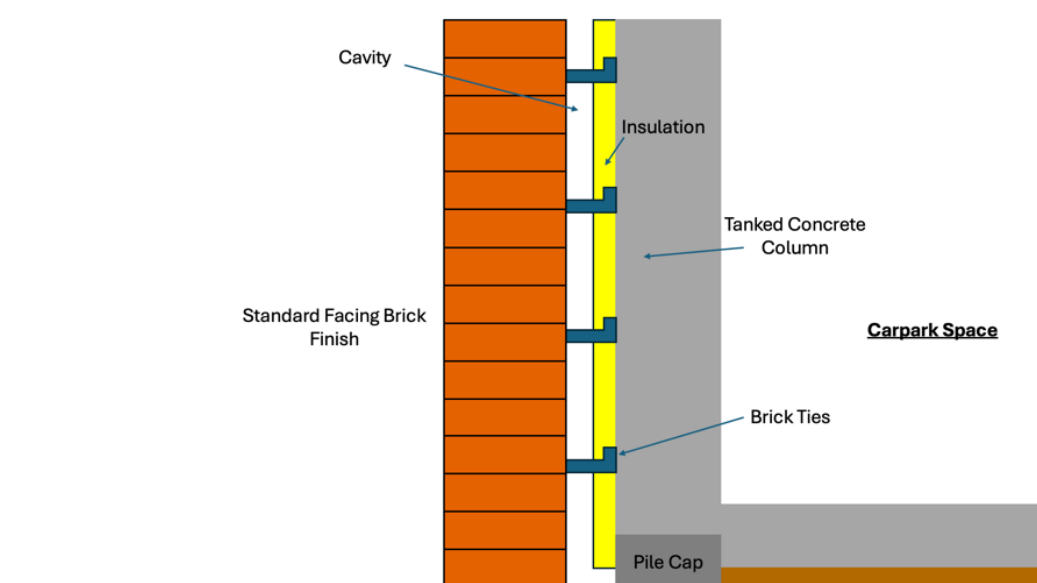


Figure 4.1: Diagram detailing the brick facade tied back to the concrete columns at carpark level

Above the carpark, the external appearance will alternate to curtain walling and rainscreen cladding. Curtain wall has become popular amongst office and leisure spaces (*figure C3 and C6*), whilst rainscreen cladding is predominantly constructed on accommodation units (*figure C4 and C5*) although its use is typically widespread.

Rainscreen cladding is a weather resistant shield that protects the internal envelope from the elements. This system is extremely effective in protecting the internal envelope from driven rainfall. *Figure 4.2* illustrates that the external cladding is supported on a bracket system that is fixed back to the structural frame, creating a vented cavity which crucially works to equalise the air pressure to limit the driven rain effect (*Emmitt and Gorse 2010*). Given the location of the development, it is essential that the rainscreen material can withstand the chemically charged oceanic elements, such as marine grade aluminium.

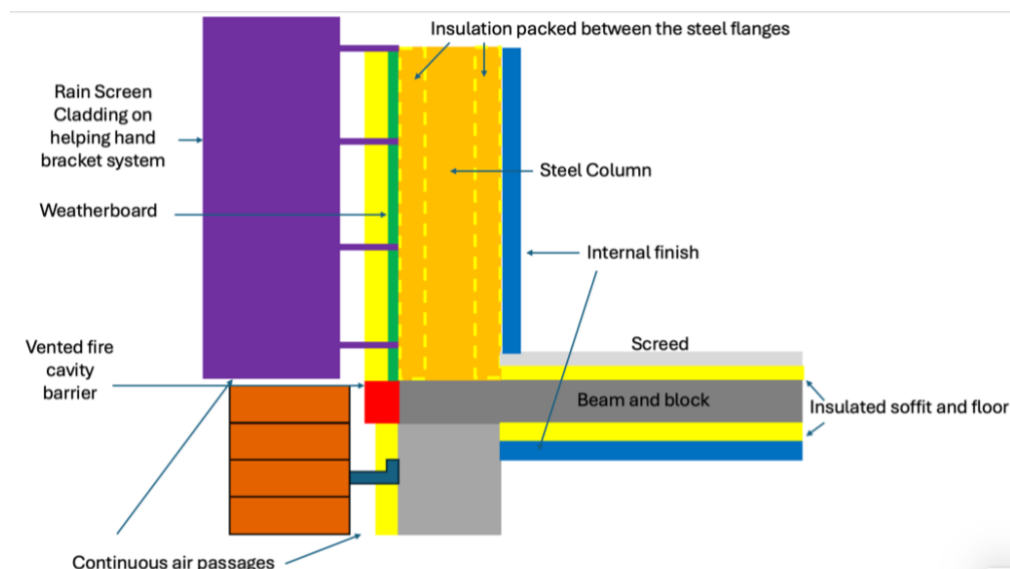


Figure 4.2: Detail of the interface transition between the brick facade and the curtain wall

The continuous vented cavity presents significant fire and water hazards (*Chudley and Greeno 2006*). To prevent the spread of fire whilst maintaining a vented system, vented fire barriers or perforated pressed steel coated in intumescent paint are fixed within the cavity. A fire barrier that restricts airflow will compromise the rainscreen system by

creating unequal air pressure which enables rain to be driven inwards and potentially promote rot to any wooden based material between the systems. Additionally, if driven rainfall does penetrate the rainscreen joints, the weatherboard is lined with an impermeable breather membrane that allows water to fall vertically to a cavity tray and redirected outwards.

The placement of the rainscreen cladding is strategic to provide privacy to the living quarters on the upper floors, and to WCs and offices on the communal floor. Curtain walling would not be suitable in these locations, hence why the design has restricted the product to the public open-plan areas (*figure 4.3*). These large, glazed façades permit natural light and provide scenic views from the surrounding docks. *Emmit and Gorse (2010)* discuss two types of curtain walling, stick system and unitised system. This report suggests a unitised system because of its off-site construction its deemed that the systems weatherproofing, acoustic, and thermal properties are superior to a stick system due to the stick system being an on-site construction and more susceptible to human error. The entry and exit points for the building will also form part of the curtain wall for aesthetics.

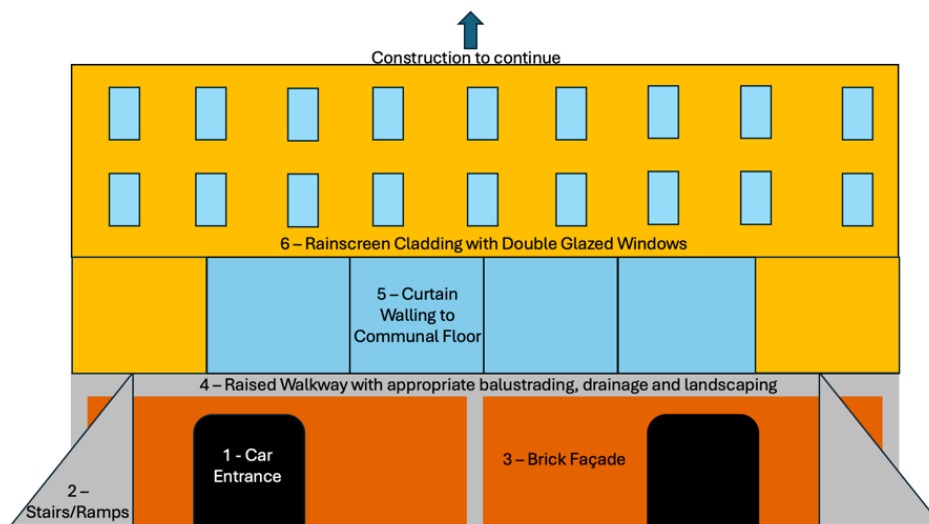


Figure 4.3: A basic 2D illustration displaying the appearance of the student accommodation

As presented in *figure 4.3*, ramps and stairs are required to gain access to the building above the carpark. The raised walkway will be wide enough to accommodate a mechanical lift, footfall, drainage, landscaping and outdoor gathering spaces. The

walkway could be seen as a proxy-balcony, a unique and modern feature to the PoWD. The walkway will be a self-supporting structure on reinforced concrete columns, whilst the deck will be constructed with precast beam and block which butts the main building, requiring a compressible expansion joint along the whole perimeter of the development.

Finally, to deliver a unique feature precast steps with an incorporated ramp will span the entire western elevation of the building up to the raised walkway. This will deliver a physical connection from the building to the promenade that connects the surrounding docks and marinas. The inspiration for this design was taken from the Capitol Building in Washington D.C (*figure 4.4*) and the Sydney Opera House (*figure 4.5*).



Figure 4.4: Capitol Building (iStock 2012)



Figure 4.5: Sydney Opera House (Google Earth)

The following figures are illustrations of the four finished external elevations in line with all the content that has been discussed. No landscaping or safeguarding such as balustrades are detailed, it is solely for the appreciation of the concept design.

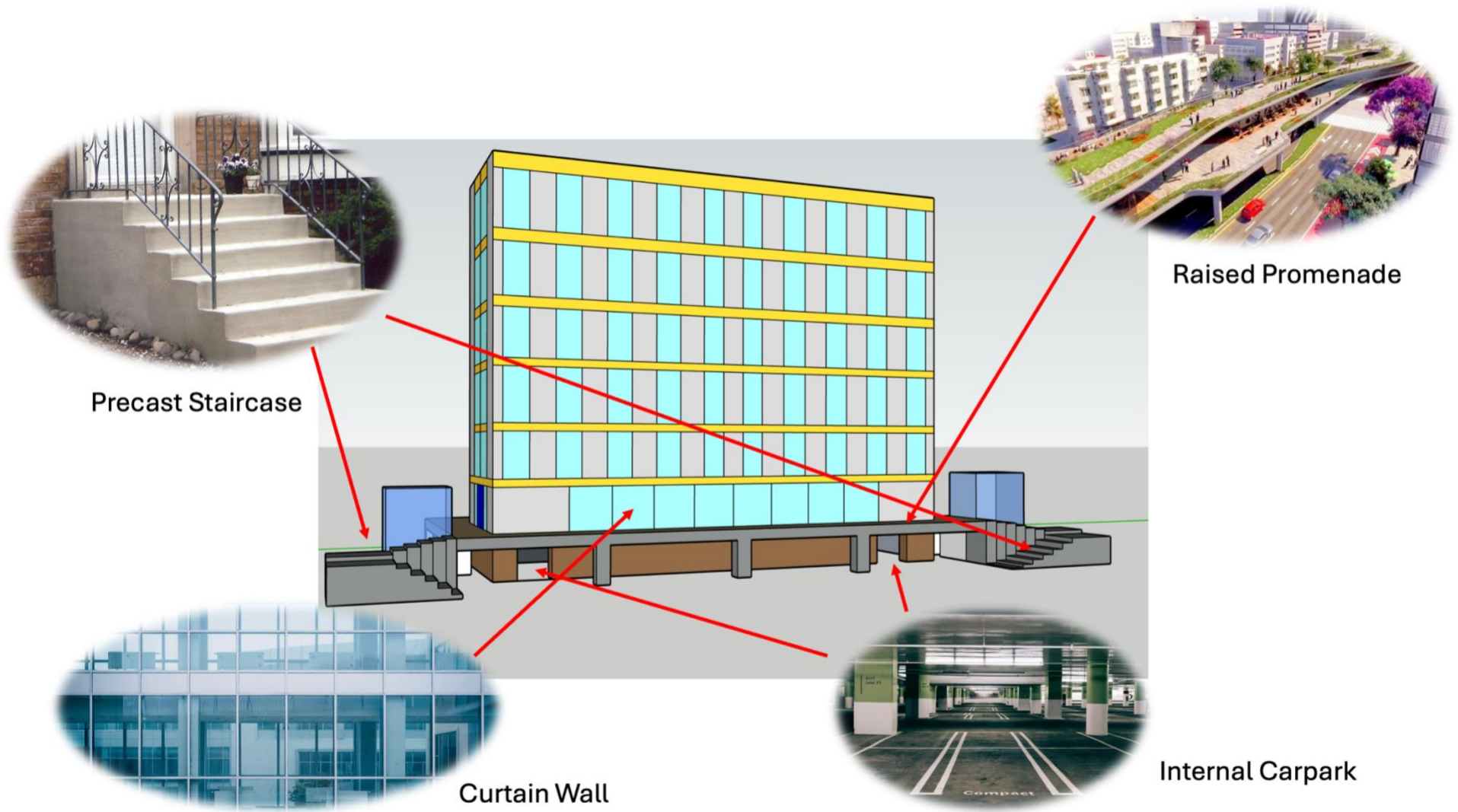


Figure 4.6: East Elevation

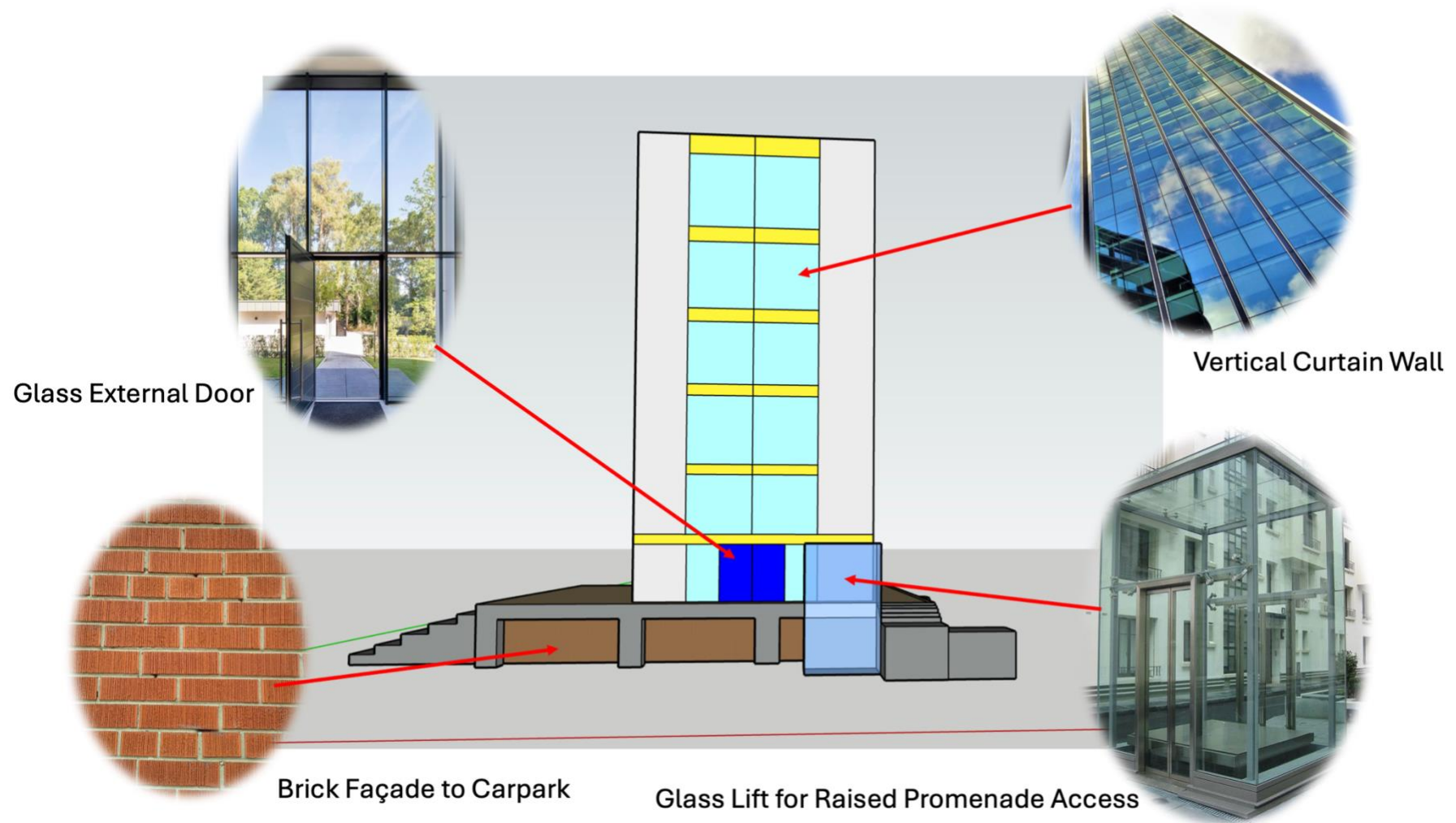


Figure 4.7: South Elevation



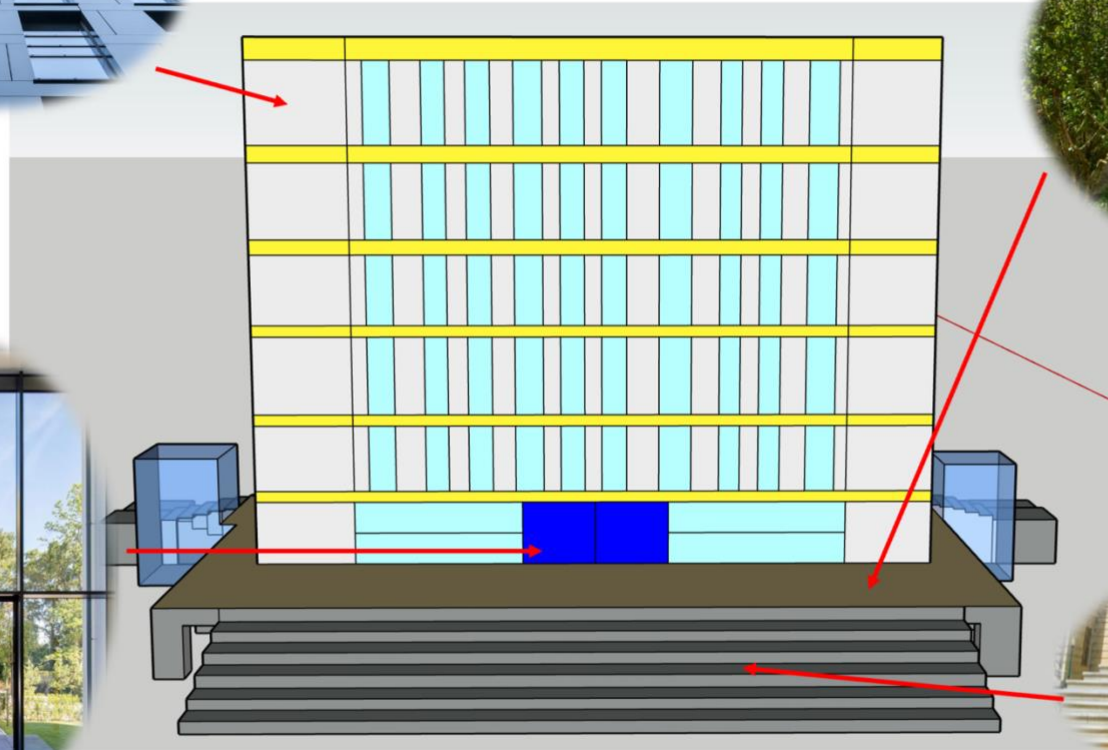
Rainscreen Cladding



Decorative Landscaping



Big Glass Doors to Curtain Wall



Decorative Precast Stairs

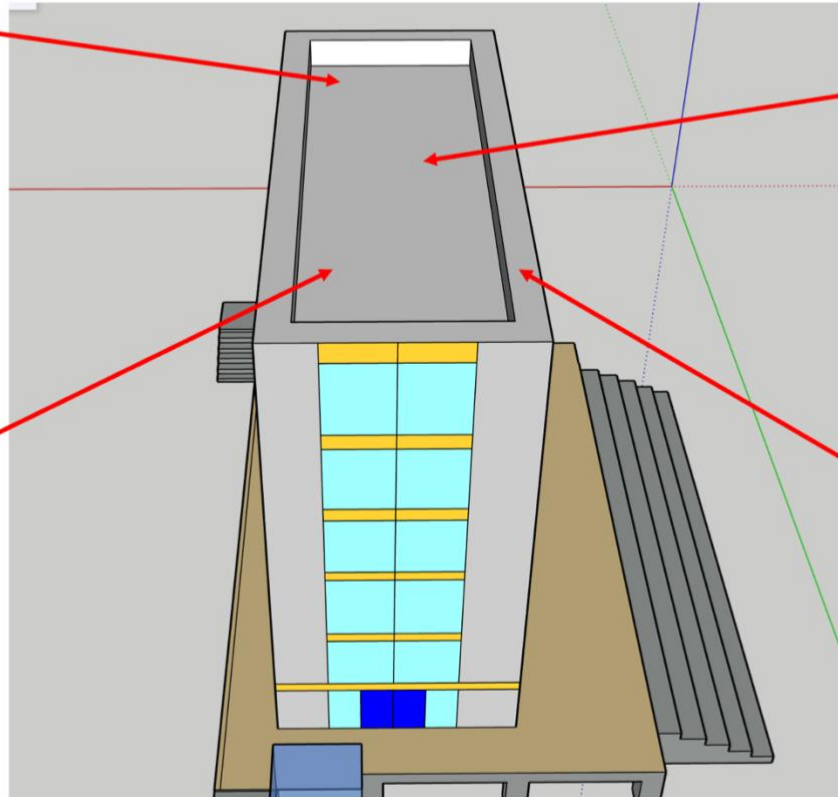
Figure 4.8: West Elevation



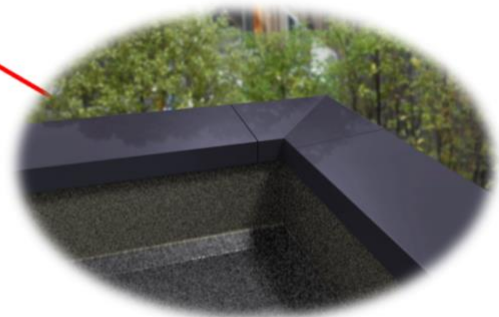
Solar Panels



Mechanical Plant



Green Roof



Aluminium Parapet

Figure 4.9: North Elevation

5. CONCLUSION

To conclude, this report aimed to utilise available information to develop a practical and aesthetical design for a medium-high rise student accommodation. Historical and geological data influenced the foundation arrangement, supplemented by borehole records from nearby sites (see appendix B). A lower concrete frame that supported a continued steel frame is ideal for the foundation arrangement. The steel frame enabled the design to incorporate greater internal spaces due to the spanning capability of steel between supports.

The external envelope is inspired by the local urban architecture. It is essential that the design could withstand the heavy winds and rainfall that the PoWD experiences, therefore rainscreen cladding is appropriate due to its capabilities to protect the inner envelope from driven rain. The curtain walling is strategically positioned to public areas, firstly to provide natural light and scenery, but also to safeguard privacy to the habitable zones.

Despite the desire to maintain the urban aesthetic, it was necessary to apply a uniqueness to the building ensuring that it was not lost to its urban surroundings, although equally important that it did assimilate and embrace its urban environment. To execute this, the design incorporated a wide external staircase, external glass cladded elevators, and a raised access walkway complete with modern landscaping. The wide staircase leading to the raised access walkway looks on to the marina, as it connects the promenade to the building creating a physical connection between the building and the marine environment.

PERMITTED WORD COUNT: 2500 (+/- 10% = 2750)

REPORT WORD COUNT: 2729

APPENDIX A – GEO-HISTORICAL

History

The PoWD did not exist until the late 19th century (*figure A1*) when it was commissioned in 1880s. Since its opening the dock was mainly utilised to support Swansea's heavy industry, and having its industrial significance, it was heavily bombed during WWII. Post WWII heavy industry declined, and the dock became developed to serve modern needs. Evidently, the site is heavily contaminated with potential industrial infrastructure still buried beneath the ground such as railway tracks, and metalwork.



Figure A1: Map of Fabians Bay, the PoWD site in the 1880s (Digimaps)

Geology

The PoWD is constructed on made ground and consequent to its history it would be common to uncover contaminated ground, metals, rubble, train tracks, and potential unexploded bombs (*figure A2*). Naturally this concoction of poor ground requires any large-scale development to investigate deeper for load bearing strata.

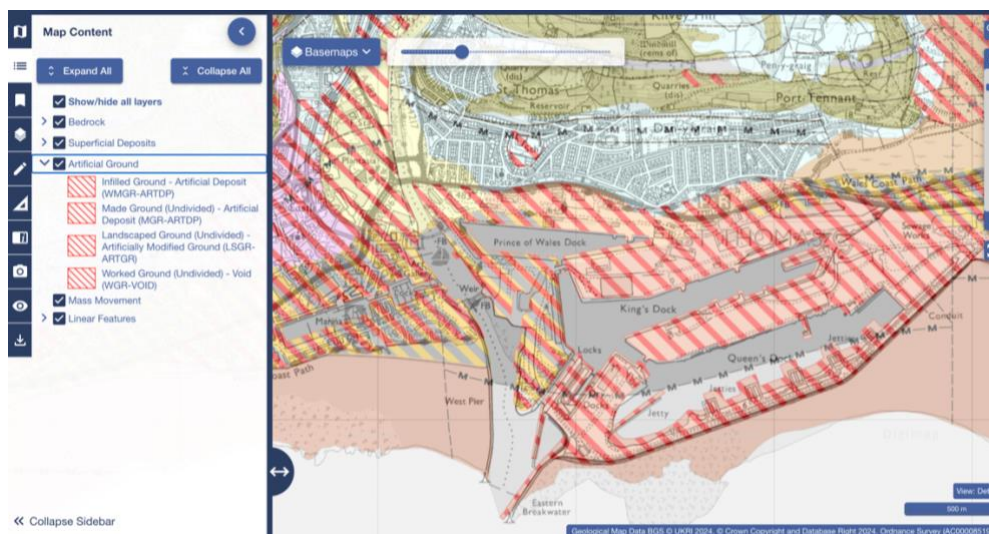


Figure A2: Map of made ground in the PoWD (Digimaps)

The made ground was deposited on marine beach deposits, known as a superficial deposit of blown sand which again is not an ideal bearing plain (*figure A3*). Not until the South Wales Middle Coal Measures Formation is reached can reliable bedrock be located comprising of mudstone, siltstone, and sandstone.

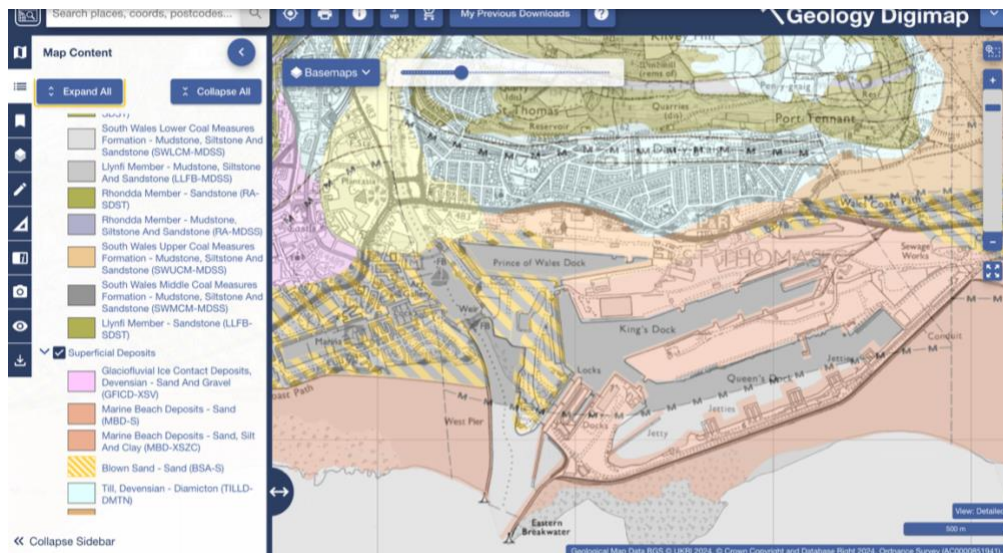


Figure A3: Digimap presenting the bedrock and superficial deposits in the PoWD

Meteorological

The site is situated in a significant flood risk zone according to Natural Resources Wales (NRW) (*figure A4*). Naturally this is consequential of its proximity to the shoreline and river, however a flood of this extent has yet to be recorded. More typically the site will expect some raised surface water levels, especially as Swansea received an annual average rainfall of 1021.59mm between 1991-2020 (*Met Office 2024*).

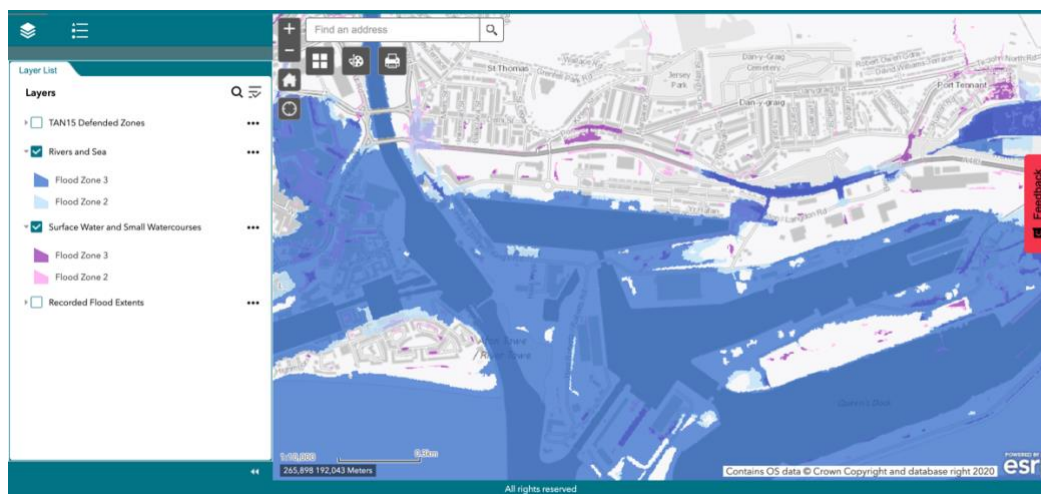


Figure A4: Flood risk map (NRW)

Moreover, the site is exposed and vulnerable to strong south westerly winds. These winds are very influential during the winter months, although they are forever present regardless of seasonality.

APPENDIX B – BOREHOLES

Detailed below are three boreholes taken from the British Geological Survey (*BGS*) at locations in proximity or within the PoWD (*figure B1*). These provide an intrusive examination of the ground conditions, which can lend themselves to an indicative overview of the subterranean environment at the proposed site to supplement the foundation design.

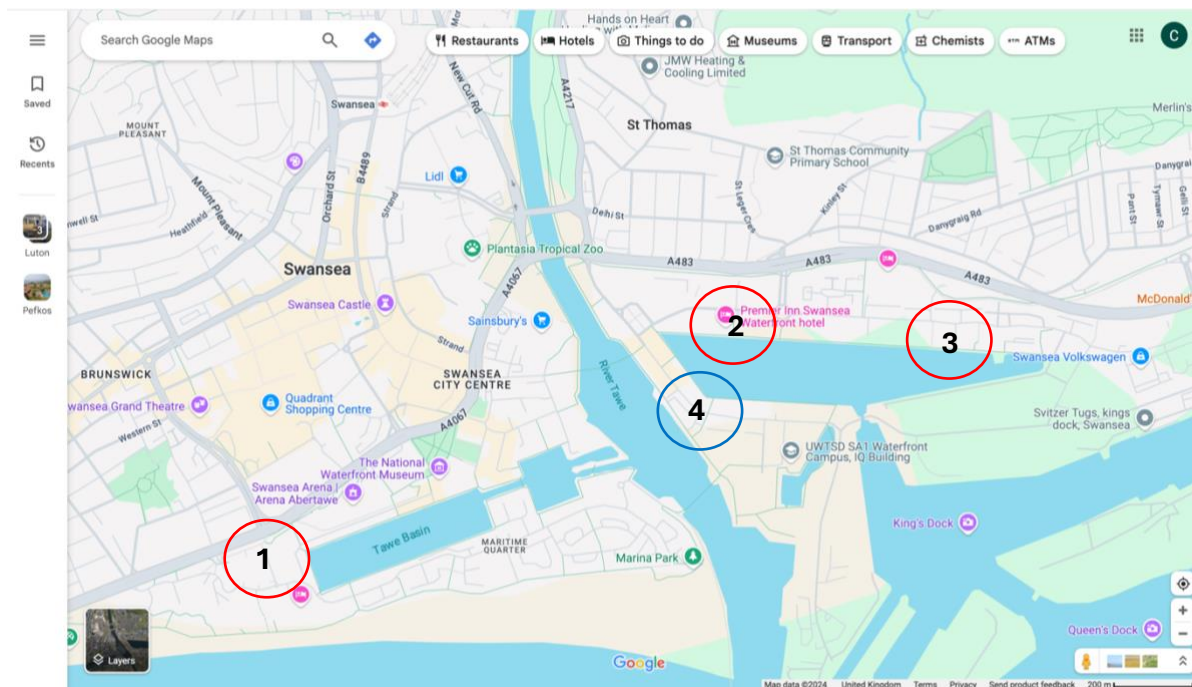


Figure B1: Google Maps image indicating the locations of the recorded boreholes from the BGS. 1 – Paxton Street SS69SE345. 2 – PoWD SS69SE293 (1). 3 – PoWD SS69SE94 (2). 4 – Proposed site

As anticipated, the borehole records taken from the PoWD coincide with the geological evidence that the site is made ground to shallow depths overlays sandy beach deposits to varying depths. Both boreholes sampled depths of up to 30m, with limited indication of mudstone, nevertheless siltstone appears as the dominant bedrock at approximately >25m. Likewise, Paxton Street follows a similar formation, where superficial deposits of made ground and gravelly sand is present in the upper layers of ground. This is followed by clays at >7m and mudstone at >19m.

1 - Paxton Street Borehole Record

DRILLING METHOD		GROUND LEVEL		CORE HOLE NUMBER				
Percussion 200 mm dia. to 15.0 m "Open hole" rotary drilling From 15.0 m to 22.0 m		+ 9.18 m O.D		55 65399228 SS69SE 345				
MACHINE		COKE BARREL AND BIT DESIGN		ORIENTATION				
Dando "Investigator"				Vertical				
SOIL SAMPLES DEPTH AND TYPES		DRILLING AND CASING PROGRESS		WATER RECOVERY % AND Q.M. LEVEL				
				R. Q. D.				
				CORE RECOVERY % AND SIZE				
				DESCRIPTION OF STRATA				
				THICKNESS m				
				O.D. LEVEL				
				SYMBOL				
1.00 P N= 8	5-2.75			0-50	MADE GROUND consisting of ashes.	0.50	5.18	
1.50 P N= 6				1.50	MADE GROUND consisting of loose, light grey fine-medium sand.	1.00	6.68	
3.00 P N= 9				1.50	MADE GROUND consisting of grey sand with layers of soft sandy clay	1.05	7.68	
4.00 P N= 75 for 150 mm				2.55	MADE GROUND consisting of soft red-brown sand clay with brick shale.	0.95	6.63	
5.00 P N= 105 for 225 mm				3.50	MADE GROUND consisting of dense bricks, ashes, sand and clay.	1.45	5.68	
6.00 P N= 75 for 150 mm	5-2.75 6-2.75			4.95	Very dense brown sandy GRAVEL with traces of sandy clay	2.05	4.23	
7.00 P N= 77				7.00	Very dense brown SAND with some gravel.	0.95	2.18	
8.00 P N= 34				7.95	Stiff grey-brown gravelly BOULDER CLAY		1.23	
9.00 P N= 67						3.05		
10.00 P N= 63								

REMARKS

Borehole drilled by STRATA SURVEYS Ltd Cheshire.

P = Standard Penetration Test

N = Number of blows for 300 mm (unless otherwise stated)

Scale 1:50

Water a.m. level

Borehole chiselled from 4.0 m to 15.0 m

Sheet 1 of 3

WEST GLAMORGAN COUNTY COUNCIL

COUNTY ENGINEER AND SURVEYOR'S DEPT.

SITE PROPOSED NEW COUNTY HALL PAXTON STREET SWANSEA					SHEET 2 OF 3 BOREHOLE NUMBER 5569SE 315 2			
SOIL SAMPLES DEPTH AND TYPES	DRILLING AND CASING PROGRESS	WATER RECOVERY % AND O.M. LEVEL	R.Q.D.	CORE RECOVERY % AND SIZE	DESCRIPTION OF STRATA	THICKNESS	O.D. LEVEL	SYMBOLIC LOG
		20 40 60 80	20 40 60 80	20 40 60 80				
11.00 P N=75 for 150mm	6.2.75 7.2.75				11.00		-1.82	
12.00 P N=75 for 150mm	7.2.75 10.2.75				Very stiff grey gravelly BOULDER CLAY			
13.00 P N=75 for 150mm								
14.00 CP N=75 for 75mm								
15.00 CP N=105 for 150mm	10.2.75 11.2.75					7.60		
16.50 CP N=75 for 150mm								
18.00 CP N=75 for 150mm	11.2.75 12.2.75				18.60		-9.42	
"Open hole" drilling due to pebbles falling in hole - coring not possible.					Grey MUDSTONE (Driller's description)	3.40 (penetrated)		
REMARKS P= Standard Penetration Test CP= Standard Penetration Test - solid cone N= Number of blows for 300 mm (unless otherwise stated) Borehole continued to 22.00m								
WEST GLAMORGAN COUNTY COUNCIL COUNTY ENGINEER AND SURVEYOR'S DEPT.								

2 - PoWD SS69SE293 (1) Borehole Record



British
Geological
Survey

BGS ID: 370193 : BGS Reference: SS69SE292
British National Grid (27700) : 266469,192921

10/10/19 01:50:00 00370 10/10/19 01:50:00 00370 10/10/19 01:50:00 00370

RECORD OF SHALLOW BORES FOR MINERALS

and Number of Shallow Bore given by Geological Survey:

Name and Number given by owner (if different from above): Prince of Wales Dock

Town or Village: Swansea Date of sinking: 1923

Exact site: Swansea Harbour, East Docks

Purpose for which made: Location of foundations for Berth 10

Level at which here commenced relative to O.D.: 66.00 If not down bore, state if from a lat on up

Made by: For Messrs

Information from: W. H. Jenkins (Resident Engineer) Date received: 1923

Specimens: 1 Dip of strata: 1:1

Geological Classification	Description	Depth (ft)	Depth (m)
<u>NO 1 Bore</u>	<u>small running gravel</u>	<u>0-4.0</u>	<u>1.2</u>
	<u>dirty sand</u>	<u>4.0-8.0</u>	<u>1.2-2.4</u>
	<u>coarse sand with stones</u>	<u>8.0-12.0</u>	<u>2.4-3.6</u>
<u>NO 2 Bore</u>	<u>hard gravel</u>	<u>0-6.0</u>	<u>1.8</u>
	<u>gravel</u>	<u>6.0-12.0</u>	<u>1.8-3.6</u>
	<u>clay</u>	<u>12.0-16.0</u>	<u>3.6-4.8</u>
	<u>gravel</u>	<u>16.0-24.0</u>	<u>4.8-7.2</u>
	<u>coarse sand & stones</u>	<u>24.0-32.0</u>	<u>7.2-9.6</u>
<u>NO 3 Bore</u>	<u>sand & stones</u>	<u>0-12.0</u>	<u>3.6</u>
	<u>peat & clay</u>	<u>12.0-16.0</u>	<u>3.6-4.8</u>
	<u>fine gravel</u>	<u>16.0-24.0</u>	<u>4.8-7.2</u>
	<u>clay</u>	<u>24.0-32.0</u>	<u>7.2-9.6</u>
	<u>gravelly sand</u>	<u>32.0-40.0</u>	<u>9.6-12.0</u>
	<u>hard sandy clay with some stones</u>	<u>40.0-48.0</u>	<u>12.0-14.4</u>
<u>NO 4 Bore</u>	<u>lipped shales from works</u>	<u>0-12.0</u>	<u>3.6</u>
	<u>peat & sand</u>	<u>12.0-16.0</u>	<u>3.6-4.8</u>
	<u>hard sandy clay</u>	<u>16.0-24.0</u>	<u>4.8-7.2</u>
<u>NO 5 Bore</u>	<u>chalk & clinders</u>	<u>0-12.0</u>	<u>3.6</u>
	<u>clinders</u>	<u>12.0-16.0</u>	<u>3.6-4.8</u>
	<u>small gravel</u>	<u>16.0-24.0</u>	<u>4.8-7.2</u>
	<u>peat</u>	<u>24.0-32.0</u>	<u>7.2-9.6</u>
	<u>sand & blue clay</u>	<u>32.0-40.0</u>	<u>9.6-12.0</u>
	<u>clay & sand with some stones</u>	<u>40.0-48.0</u>	<u>12.0-14.4</u>
	<u>fine gravel</u>	<u>48.0-56.0</u>	<u>14.4-16.8</u>
	<u>clay & fine gravel</u>	<u>56.0-64.0</u>	<u>16.8-19.2</u>
	<u>clay & small gravel</u>	<u>64.0-72.0</u>	<u>19.2-21.6</u>
	<u>gravel</u>	<u>72.0-80.0</u>	<u>21.6-24.0</u>

Geological Survey and Museum, South Kensington, London, S.W.7.

Drawn by: 10/10/19 Site marked on U. Map by: 10/10/19

Contact BGS: ngdc@bgs.ac.uk

British Geological Survey

 BGS ID: 370199 : BGS Reference: SS69SE298
 British National Grid (27700) : 266741,192809

Contact BGS: nadc@bgs.ac.uk

APPENDIX C – SURROUNDING LOCAL DEVELOPMENTS

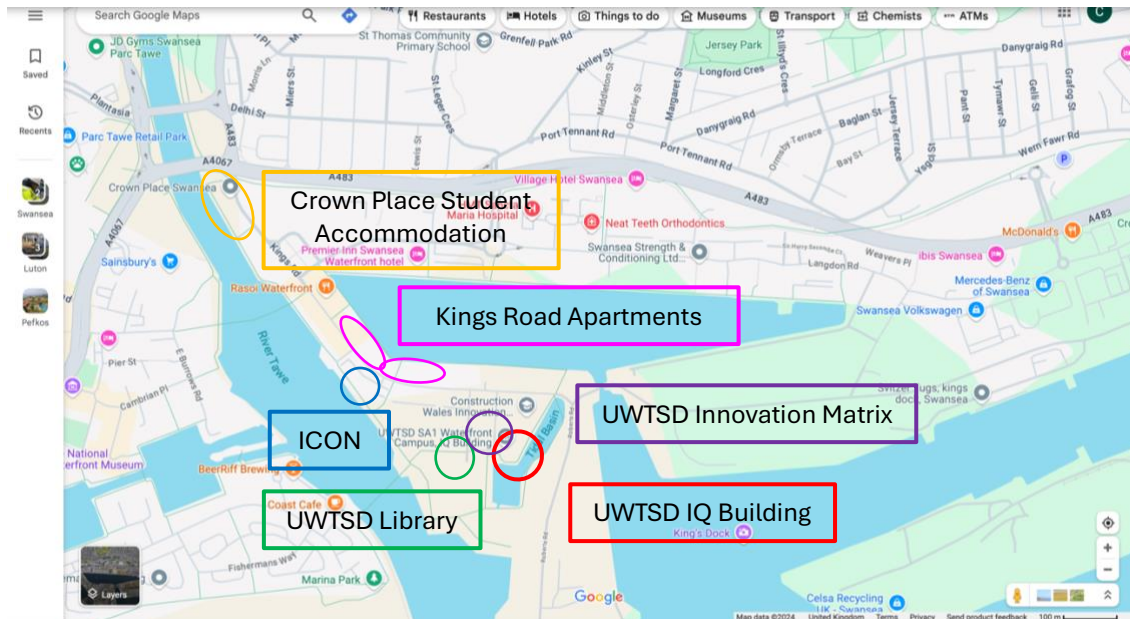


Figure C1: A Google Map locating the surrounding PoWD developments

Although not many public resources are available regarding the construction details to the surrounding PoWD buildings (*figure C1*), it is possible to observe the external envelope. That being said, *NEC (2019)* produced an article stating that the IQ building (*figure C2*) was constructed by excavating and backfilling 1800mm of contaminated soil before installing concrete piles. The piles supported a lower reinforced concrete frame, a steel upper frame, with brick clad walls, and profiled metal roofing. The building forms part of the wider master plan for UWTSD, that has seen the establishment of their library adjacent to the IQ Building constructed with identical features such as the brick facades and curtain walling.



Figure C2: UWTSO IQ Building

Recently, the addition of the ‘Innovation Matrix’ building to the site has deviated away from the existing facades. The Innovation Matrix is a steel frame construction, dressed in a brown metal profile sheet cladding, fronted in a South-Westerly curtain walling (*figure C3*). Possibly the change of facade may be influenced by the weathering of the Library and IQ’s brick panels as the mortar reacts with the marine atmosphere. Furthermore, the Innovation matrix has capitalised on the natural light influx by installing the South-Westerly curtain wall, however you would anticipate that this design will have pacified the solar gain.



Figure C3: UWTSO Innovation Matrix (*BusinessNewsWales 2024*)

Opposite the proposed development plot, there are apartments situated on Kings Road (*figure C4*). Although this report could not locate any documentation on their

construction, a reasonable assessment can be drawn from their appearance. The apartments are medium-rise blocks, mix cladding, limited curtain walling, with a combination of pitches and flat roofing that also appears to be cladded. The foundation type is unconfirmed, but one can make an educated assessment that foundation piles were used due to the height of the apartments and the PoWD ground conditions.



Figure C4: Kings Road apartments (Google Maps).

Figure C5 presents one of the recent local developments that is the new student accommodation on Kings Street. These apartment units are much larger than those on *figure C4*, and despite having a cladding finish they also differ visually. The design has incorporated many more windows and curtain walling, whilst remaining consistent with the parapet roofs which are equipped with PV panels. No foundation design information was identified, although yet again it can be assumed that these buildings were also piled.



Figure C5: Crown Place Student Accommodation

Lastly, the small rise building that is home to the clinical research company ICON sits between the proposed site and UWTSD (*figure C6*). In comparison to its size, the design incorporates a fair area of curtain walling amongst its cladded facade, especially around the edges and at its centre. The roof is pitched to allow rainwater run-off into the rainwater pipes; however this has been disguised by the relatively flat eaves and can only be seen from above. Furthermore, despite its smaller stature it was almost certainly piled because of the weak upper layers of made ground that exists in the area.



Figure C6: ICON Building on Kings Street

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